THE USE OF ANATOMICAL PROPERTIES OF FLAX VARIETIES ON THE CONFIRMATION OF THEIR IDENTITY*

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INTRODUCTION

The purpose of any identifactory key is to enable its user to ascertain the correct name of an unknown plant with the greatest of ease. Basically, this is most often accomplished by successive exclusions of plants represented in the key whose characters do not coincide with those of the unknown plant, until the field narrows to a single plant or in some cases to a few plants which have the highest resemblance to the unknown one. The characters used in botanical identification should be as easily observable by the user of the key as possible and that the recording of the anatomical characteristics of the different flax varieties is rather laborious, time consuming and requires the use of certain apparatus.

The current investigation had been designated to use some anatomical properties of flax varieties to confirm their identification through the use of a dichotomous (non-indented) key. Some investigators followed the same procedure in different crops such as Crozier (1950), Goodal (1968), Hall (1970), El-Gazzar et al. (1975), El-Shimy (1975) and others.

MATERIALS AND METHODS

Twenty introductions (Int.) of common flax (Linum usitatissimum L) from various Experimental Stations were sown on November 27th, 1971. Plants were arranged in rows 3 meters long and 20 cm. apart. They received the common cultural processes necessary used at the flax breeding nursery. Free hand cross section had been cut in the middle of technical length after 120 days from planting and double stained in safranin and light-green according to schedule

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mentioned by Johanson (1940). By means of fibroscope at magnifications of 50 X, the image of each section was projected on a white sheet of paper, then traced exactly at the border of each tissue.

By means of a planimeter, the total area, the outer tissue, fibres, xylem and pith tissues percentages were measured, semi-permanent pollen preparations had been made according to the simple method mentioned by Franks and Watson (1963). In addition, another hand section had been cut in the middle of the capsule to examine its septa.

EXPERIMENTAL RESULTS

The eight characters recorded for each introduction are briefly outlined as follows :

Pollen grains (i.e. P.G.) : Average of 10 diameter measurements (80 x 80 - 120 x 104).
Outer tissue area (i.e. O.T.) : Calculated from 5 cross sections (1.5 - 8.4).
Fibre area % (i.e. F.A.) : Calculated from 5 cross sections (7 - 19.2).
Xylem area % (i.e. X.A.) : Calculated from 5 cross sections (28.9 - 49).
Pith area % (i.e. P.A.) : Calculated from 5 cross sections (31 - 52.3).
Fibre index (i.e. F.I.) : Calculated from mean fibre area in the cross sections/mm^2x length of stem from cotyledons to the first top branch mm. (4068 - 16776).
False septum (i.e. S.) : Ciliate (i.e. +)/smooth (i.e. -) phloem fibre distribution (i.e. P.F. : in separate groups (i.e. ++), adjacent groups (i.e. +), complete ring (i.e. -).

The description and values of the twenty introductions studied according to the above mentioned characters are tabulated in Table (1).

The Key

According to the basis of the non-idented dichotomous key, in addition to the data recorded for each introduction, the following key could be constructed :

1- Septum smooth 2
Septum ciliate 10

Table 1 : Descriptions and values of anatomical and technological characters of 20 flax introductions.

Int. code No.	Characters							
	P.G.	O.T.	F.A.	X.A.	P.A.	F.I.	S	P.F.
21	104 x 120	6.0	9.0	31.0	43.0	11038	+	+
26	92 x 100	8.4	19.2	41.6	31.2	13983	+	+
57	96 x 100	8.3	18.6	29.6	40.6	12034	-	++
83	92 x 100	1.5	8.5	42.0	46.2	4068	+	++
112	88 x 88	4.6	13.4	40.3	39.1	10396	+	++
125	100 x 100	4.8	13.9	37.4	43.0	12241	+	++
128	100 x 108	5.2	9.0	30.3	50.8	6635	-	++
133	88 x 88	4.7	8.6	31.7	52.3	7689	+	+
144	96 x 100	8.2	15.1	31.3	44.2	11991	+	+
161	100 x 104	3.5	13.6	35.6	48.6	11190	+	+
168	80 x 80	6.9	15.5	28.9	42.0	10650	+	+
170	100 x 100	6.4	15.3	35.4	37.4	11895	-	-
182	80 x 92	5.4	12.0	37.2	45.1	10478	+	+
196	88 x 92	8.6	10.4	30.9	38.8	8863	+	+
198	92 x 100	5.7	12.9	34.8	44.4	8303	-	+
231	88 x 100	5.1	10.5	49.0	31.0	8720	-	+
240	96 x 100	2.6	7.0	41.9	46.8	4342	-	-
273	92 x 100	4.3	14.3	33.4	46.3	11044	-	++
299	84 x 92	5.8	13.6	28.8	39.0	16776	-	++
301	88 x 92	6.2	12.8	31.0	45.4	15802	-	++

2- Fibres in separate groups 3
Fibres in adjacent groups or in complete ring 7

3- Fibre index more than 15000 4
Fibre index less than 12200 5

4- % Pith area 39, fibre index 16776 : ... (Int. 299)
% Pith area 45.4, fibre index 15802 ... (Int. 301)

5- Fibre index 6635, % fibre area 9 ..... (Int. 128)
Fibre index more than 11000, % fibre area more than 14 6

6- % Outer tissue area 8.3, % pith area 40.6; fibre index 12034 ..... (Int. 57)
% Outer tissue area 4.3, % pith area 46.3, fibre index 11044 ..... (Int. 273)

7- Fibres in complete ring 8
Fibres in adjacent groups 9

8- % Outer tissue area 6.5, % fibre area 15.3; fibre index 11895 ..... (Int. 170)
% Outer tissue area 2.6 % fibre area 7.0; fibre index 4342 .....(Int. 240)

9- % Xylem area 49, % pith area 31 .....(Int. 231)
% Xylem area 34.8, % pith area 44.4 ....(Int. 198)

10- Fibres in separate groups 11
Fibres in adjacent groups 13

11- % Outer tissue area 1.5, % fibre area 8.5; fibre index 4068 ..... (Int. 83)
% Outer tissue area more than 4, % fibre area more than 13; fibre index more than 10000 12

12- Pollen dimention 88 u, fibre index 10396(Int. 112)
Pollen dimention 100 u,fibre index 12241(Int. 125)

13- % Xylem area more than 35 14
% Xylem area more than 32 16

14- % Fibre area 19.2, fibre index 13982.. (Int. 26)
% Fibre area less than 14, fibre index, less than 11200 15

15- % Outer tissue area 35, pollen diameter 104 x 100 u ..... (Int. 161)
% Outer tissue area 5.4, pollen diameter 92 x 80 u ..... (Int. 182)

16- % Fibre area more than 15 11
% Fibre area less than 11 18

17- Pollen diameter 100 x 96 u, fibre index 11911 ..... (Int. 144)
Pollen dimension 80 u, fibre index 10650.... 168)

18- % Pith area 52.3, fibre index 7689 ... (Int. 133)
% Pith area less than 44, fibre index more than 8800 19

19- Fibre index 8863, % Pith area 38.8... (Int. 196)
Fibre index 11038, % pith area 43 ... (Int. 21)

DISCUSSION

From the results concerning the anatomical characters which varied among the different introduction, it was evident that there was a certain degree of associations among the recorded characters. As an example, the data showed that the increase in fibre area was not only correlated with the decrease or increase in xylem area but was also correlated with pith area. This is in coincide with that obtained by El-Shimy (1975) which mentioned that the lowest flax variety in xylem area was associated by an increase in fibre area per cross section.

Furthermore, it was noticeable from the key that the characters used to distinguish two taxa or groups of taxa were also given in the same order for each of them, thus enabling proper comparisons between them. The false septum character could be divided the twenty introduction into two main groups which had not been recognized previously. One group incorporated eleven introduction and was characterized by smooth septum, while the other group contained the remaining introduction with ciliate septum. The other characters were also used for dividing the two main groups to smallest ones. Generally, it could be concluded that such results explained the possibility to use some anatomical properties of flax varieties to confirm their identifications through the use of a dichotomous (non-idented) key.

SUMMARY

1- Comparative observations of the eight anatomical characters; pollen grains diameter, outer tissue area %, fibre area %, xylem area %, pith area %, fibre index, false septum and phloem fibre distribution; for twenty introductions of common flax are recorded. Such characters showed a certain degree of association with their potential taxonomic.

2- Confirmation for the identity characters through a dichotomous (non-identity) key was presented.

REFERENCES

Crozier, M.N. (1950). Microscopic examination of the section stem of Liner flax (Linum usitatissimum). Part I. Microscopic analysis as a means of predetermining yield of scutch fibre. Part II. Examination of quality factors and their correlation with commercial grounding. N.Z.J. Sci. Tech. 6 : 17 - 30. (C.F. Pl. Breed. Abst. 22, 2. 1284, 1953).

El-Gazzar, A., B.M. Sallouma, and M. El-Abdellah.(1975). The identification of some cotton varieties. Phytologia. Vol. 31. No. 3.

El-Shimy, G.H. (1975) : Morphological and anatomical studies on the characteristics of some Linum usitatissimum varieties and their relation to yield. M.Sc. Thesis, Fac. of Agr., Univ. of Ain Shams.

Franks, J.W. and L. Watson (1963) : The pollen morphology of some critical Ericales. Pollen spowes, et spores. 5 : 51 - 68.

Goodall, D.W. (1968) : Identification by computer. Bioscience, 18 : 485 - 488.

Hall, A.V. (1970). A computer-based system for forming identification keys. Taxon, 19 : 12 - 18.

Johanson, D.A. (1940) : Plant microtechnique 2nd Ed. McGraw-Hill Book Co. Ltd., New York.

Pankhurst, R.J. (1974) : Automated identification in systimatics. Taxon. 23 : 45 - 51.